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Examiner: Rabon A. Sergent // Group Art Unit: 1711**FAX**Fax: 571-273-8300 Pages 31Bayer MaterialScience LLC  
100 Bayer Road  
Pittsburgh, PA 15205-9741From: N. Denise BrownFax: 412-777-3902 Tel. 412-777-3804

CC:

Re: U.S. Serial No. 10/706,713  
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Enclosures:

- 1) Amendment – 30 Pages

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therein. The polyol component which is present in Example 8 is characterized by Scholl et al as forming urethane groups, not allophanate groups. Applicants respectfully submit that one of ordinary skill in the art has no insight into the presently claimed invention upon reading this reference, either alone or in combination with the Slack et al references. It is readily apparent that Isocyanate mixture 2 of this reference which comprises 46-47% of the 2,4'-isomer and 52-53% of the 4,4'-isomer does not overlap with the MDI isomer distribution required by Applicants' invention.

At best, the skilled artisan would substitute the MDI isomer mixture from Isocyanate mixture 2 of the Scholl et al reference into the process of the Slack et al references. This "substitution" would yield the process for preparing a partially trimerized isocyanate of the Slack et al references in which the isocyanate component is Isocyanate mixture 2 from the Scholl et al reference. It is respectfully submitted that this is not Applicants invention. As previously stated, Isocyanate mixture 2 of the Scholl et al reference is outside the scope of the MDI mixture required by Applicants' invention. Therefore, this combination does not render the presently claimed invention obvious to one of ordinary skill in the art.

It is respectfully submitted that the Slack et al references and the Scholl et al reference simply do not provide any insight to one skilled in the art as to what isomeric mixtures of MDI are suitable for preparing stable liquid, allophanate-modified, partially trimerized products from MDI. The only mention of some "freeze-stable liquid products" by the Slack et al reference are those set forth at column 4, lines 11-29. All of those are based on TDI, not MDI. Furthermore, those freeze-stable liquid TDI trimer products are not the subject of the Slack et al references (U.S. 5,955,609 and/or 6,127,308).

It is evident that the Slack et al references do not provide any insight to the skilled artisan seeking to prepare stable liquid MDI products that contain both allophanate and trimer modifications. It is also apparent that the Scholl et al reference only provides one skilled in the art information on how to prepare liquid trimers of MDI and/or liquid trimers of MDI in which some of the isocyanate groups are converted to urethane groups. The stable liquid allophanate-modified, partially trimerized MDI compositions of the present invention do not precipitate solids when

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stored at 25°C for 3 months, and have up to a 1% absolute change in NCO group content and up to a 10% change in viscosity when stored for 3 months at 25°C. See page 13, lines 1-7 of the present application. One skilled in the art has no insight into how to prepare such compositions from MDI upon reading the Slack et al references and the Scholl et al reference.

Furthermore, it is not obvious to the skilled artisan from this combination of references which isomeric mixtures of MDI will result in the presently claimed stable liquid allophanate-modified, partially trimerized diphenylmethane diisocyanates. As shown in Examples 18 and 19 of the present application (page 33, lines 5-17), turbid products which contain solids are formed by partially trimerizing isocyanate mixtures that contain 27% or 37% of the 2,4'-isomer of MDI. Only trimer was formed in these two examples since no compound containing a hydroxyl group was present. Both products were turbid and contained solids.

A partially trimerized MDI product was formed in Example 18 of the present application using the process as described in the Scholl et al reference. This product was prepared from a mixture of 100 pbw of MDI-1 (i.e. 98.4% of 4,4'-MDI and 1.6% of 2,4'-MDI) and 100 pbw of MDI-2 (i.e. 45.8% of 4,4'-MDI, 52.8% of 2,4'-MDI and 1.4% of 2,2'-MDI). Accordingly, the MDI mixture in Example 18 contained about 72% of 4,4'-MDI, 27% of 2,4'-MDI and about 1% of 2,2'-MDI. The partially trimerized MDI prepared from this mixture in Example 18 was turbid with about 15% solids.

In Example 19 of the present application, a partially trimerized MDI was prepared as in the Scholl et al reference, from a mixture of 60 pbw of MDI-1 and 140 pbw of MDI-2. Thus, the mixture in Example 19 contained about 61.5% of the 4,4'-isomer, about 37.5% of the 2,4'-isomer and less than 1% of the 2,2'-isomer. The partially trimerized MDI prepared from this mixture of Example 19 was turbid with 10% solids.

It is respectfully submitted that these two examples demonstrate that a partially trimerized MDI will not be a stable liquid product as defined by the present invention and required by the present claims, when using less than about 38% of the 2,4'-isomer of MDI in the starting MDI mixture. Accordingly, the skilled artisan could not possibly expect an MDI mixture comprising 10 to 40% by wt. of the 2,4'-isomer, 0 to 6% by wt. of the 2,2'-isomer and 54 to 90% of the 4,4'-isomer to form a stable

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allophanate-modified, partially trimerized diphenylmethane diisocyanate as required by the present claims. Although the products of the Scholl et al reference may be "liquids", they are not stable liquids as defined by the present invention. Examples 18 and 19 of the present application clearly support Applicants' position as these two examples show that trimerized MDI products with this range of 2,4'-isomer content are turbid with solids.

The other working examples of the present application that are illustrative of Applicants' invention clearly show that allophanate-modified, partially trimerized MDI products which are stable liquids can be formed from MDI isomer mixtures which contain from about 10 to about 40% by wt. of the 2,4'-isomer. Specifically, Example 3 contains about 12% by weight of the 2,4'-isomer and about 88% by weight of the 4,4'-isomer. In addition, Examples 5 and 10-17 contain about 37.5% of the 2,4'-isomer, about 1% of the 2,2'-isomer and about 61.5% of the 4,4'-isomer. The blended product formed in Example 20 contains a similar isomer distribution as Examples 5 and 10-17.

It is apparent, as illustrated by Examples 18 and 19 of the present application, that a MDI isomer mixture must contain greater than about 38% of the 2,4'-isomer to form a stable liquid trimerized product. Applicants therefore submit that one of ordinary skill in the art has no insight into what isomer distribution is suitable for forming stable liquid allophanate-modified, partially trimerized MDI from this combination of references.

Only after reading the present specification does the suitable isomer distribution for MDI become "obvious" to the skilled artisan. Such a perspective does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103(a).

The fact that the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) expressly disclose that some freeze-stable liquid TDI products can be formed which contain trimer groups, but no such statement is made concerning HDI or MDI products clearly implies that no stable liquid partially trimerized products of MDI or HDI were made or "found". Thus, the only information in the Slack et al references or the Scholl et al references about preparing liquid trimers based on MDI is that which is set forth in the Scholl et al reference.

As discussed above, however, the Scholl et al reference does not provide one of ordinary skill in the art any insight into what isomer distribution is suitable for preparing the presently claimed stable liquid, allophanate-modified, partially trimerized diphenylmethane diisocyanate compositions. It is also apparent from Examples 18 and 19 of the present application that a stable liquid trimer of MDI can not be prepared using less than about 38% by weight of the 2,4'-isomer of MDI. Thus, the MDI component suggested by the Scholl et al reference would not produce a stable liquid trimer of MDI except when the 2,4'-isomer content is greater than about 38%. In light of this, why would the skilled artisan expect that the presently required 2,4'-MDI isomer content to be suitable for preparing stable liquid allophanate-modified, partially trimerized MDI products?

It is further submitted by Applicants that additionally combining the Slack et al reference (U.S. 5,663,272) does not render the presently claimed invention obvious to one of ordinary skill in the art.

U.S. Patent 5,663,272 describes allophanate-modified diphenylmethane diisocyanates and a process for their production. These allophanate-modified diisocyanates are also described as being storage stable liquids at 25°C. This allophanate-modified MDI is prepared by reacting a monoisocyanate with an organic compound having at least two hydroxyl groups and a molecular weight of from about 60 to about 60000, and then reacting this reaction product with a specified isomer composition of diphenylmethane diisocyanate to form the liquid allophanate-modified MDI which has an NCO group content of 12 to 30% by weight. See column 2, lines 50-59. The specific isomer of diphenylmethane diisocyanate contains from 0 to 60% by weight of the 2,4'-isomer of MDI, less than 6% by weight of the 2,2'-isomer of MDI, with the balance being the 4,4'-isomer. (See column 2, lines 59-63.) The liquid allophanate-modified MDIs may be further reacted with an organic material which contains two or more hydroxyl or amino groups, a low MW diol, or a combination thereof, to form a prepolymer. (See column 2, line 64 through column 3, line 2.)

It is respectfully submitted that combining the '272 patent with either of the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370) does not suggest the presently claimed invention to one of ordinary skill in the art. Rather, this combination would lead the skilled artisan to

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first react a monoisocyanate (such as phenyl isocyanate) with an organic compound to form a urethane as in the '272 patent, and to react this urethane with MDI having an isomer distribution as described therein (i.e. 0 to 60% of the 2,4'-isomer, less than 6% of the 2,2'-isomer and the balance being the 4,4'-isomer) or as in the Scholl et al reference (U.S. 5,124,370), with the catalyst system of the '609 or the '308 patents. As set forth above, the Scholl et al reference describes only one monomeric MDI component (Isocyanate mixture 2) and that comprises 46-47% of the 4,4'-isomer, 52-53% of the 2,4'-isomer and less than 1% of the 2,2'-isomer. It is respectfully submitted that the combination suggested to one skilled in the art by the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370) and the Slack et al reference (U.S. 5,663,272) is not the presently claimed invention. Therefore, the presently claimed invention is not properly rejected as being obvious over this combination of references.

The other two Slack et al references (U.S. Patent 6,887,399) and U.S. Patent 6,991,746) belong to the same patent family. The '746 patent is a divisional of the '399 patent. Thus, these two patents have the same disclosure but different claims. For convenience, Applicants' will direct all their comments to the '399 patent unless otherwise noted.

The Slack et al reference ('399) relates to polymeric allophanates of diphenylmethane diisocyanate, prepolymers of these polymeric allophanates, and processes for the preparation of these products. These are higher functionality allophanate products. The '399 patent does not provide one of ordinary skill in the art any insight into the presently claimed invention when considered in view of the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370).

U.S. Patent 6,887,399 describes preparing polymeric allophanates from allophanate-modified diphenylmethane diisocyanate which comprises the reaction product of at least one OH group containing compound, and diphenylmethane diisocyanate which contains from 0 to 60% by weight of the 2,4'-isomer, less than 6% of the 2,2'-isomer and the balance (i.e. 34 to 100%) being the 4,4'-isomer. The allophanate modified MDI is held at a temperature of 20 to 70°C for a time ranging

from 1 hour to 30 days to form the polymeric allophanate modified MDI. A catalyst stopper is added once the polymeric allophanate modified MDI is formed.

Combining the '399 patent with the primary Slack et al references and the secondary Scholl et al reference does not fairly suggest the presently claimed invention to one of ordinary skill in the art. This combination of references would, at best, lead the skilled artisan to make a polymeric allophanate, partially trimerized product from diphenylmethane diisocyanate using the specified isomer distribution in the '399 patent. This isomer distribution of MDI of the '399 patent is broader than that required by the presently invention. Also, the '399 patent does not provide one skilled in the art any insight into preparing MDI based products that are stable liquids and which contain both allophanate groups and trimer groups. This reference is specific to a higher functionality polymeric allophanate. Applicants therefore submit that including this reference with the primary and secondary references does not result in the presently claimed invention.

The ranges of 2,4'-isomer and 4,4'-isomer which are disclosed as being suitable in the '399 patent are overly broad as compared to those that actually work and/or are claimed in the present invention. Thus, even if one assumes that only the isomer distribution from the '399 patent is taken and combined with the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370), these overly broad ranges of isomers do not necessarily result in a stable liquid allophanate-modified, partially trimerized diphenylmethane diisocyanate as claimed in the present application. The '399 patent does not provide any guidance to the skilled artisan which suggests the presently required isomer distribution of the MDI component.

Only after reading the present specification does the presently required isomer distribution for MDI become "obvious" to one of ordinary skill in the art. Such a perspective does not, however, provide a proper basis for a rejection under 35 U.S.C. § 103(a). Accordingly, combining the '399 patent or the '746 patent with the previously cited references simply does not suggest the presently claimed invention to one skilled in the art.

The Rosthauser et al reference (U.S. Patent 5,783,652) discloses reactivity improvement of urethane prepolymers of allophanate-modified diphenylmethane

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diisocyanates. It was found that the addition of epoxide increased the reactivity of these prepolymers. More specifically, the '652 patent describes a mixture of A) 90 to 99.5% of a stable, liquid prepolymer of an allophanate-modified MDI, and B) 0.5 to 10% by weight of at least one epoxide having an epoxide equivalent weight of 44 to 400. The allophanate-modified MDI is prepared from an isomeric mixture of MDI comprising (i) 0 to 60% by wt. of the 2,4'-isomer, (ii) less than 6% by wt. of the 2,2'-isomer and (iii) the balance (i.e. 34 to 100%) being the 4,4'-isomer.

The isomer distribution required by the Rosthauser et al reference is the same as that required by the Slack et al references (U.S. Patent 6,887,399) and U.S. Patent 6,991,746) discussed above. Applicants therefore submit that nothing "new" is added by including the Rosthauser et al reference in the rejection with regard to the isomer distribution of the MDI except the inclusion of an epoxide.

The combination of the Rosthauser et al reference with the primary and secondary references would lead one skilled in the art to make a prepolymer of the allophanate-modified diphenylmethane diisocyanate as described in the Rosthauser et al reference, with the catalyst of the Slack et al references, and add an epoxide. Incorporating either the trimer catalyst or the MDI component of the Scholl et al reference into this also does not result in the presently claimed invention. This is clearly not Applicants' invention.

One skilled in the art also does not "arrive at" the present invention by combining only the isomer distribution from the Rosthauser et al reference with the trimer catalyst of the Scholl et al reference and the catalyst system of the Slack et al references ('609 and/or '308). As previously discussed concerning the Slack et al references (U.S. Patent 6,887,399) and U.S. Patent 6,991,746), this isomer distribution for making the allophanate-modified MDI is overly broad for forming stable liquid products in accordance with the present claims.

Only after reading the present specification does it become "obvious" what MDI isomer distribution to select. Such a perspective does not, however, provide a proper basis for rejecting the presently claimed invention as being obvious under 35 U.S.C. § 103(a). Accordingly, combining the Rosthauser et al reference with the previously discussed primary and secondary references does not properly render the presently claimed invention obvious to one skill in the art.

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Finally, it is respectfully submitted that the combination of the Markusch et al reference (U.S. Patent 6,482,913) with the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370) also does not fairly suggest the presently claimed invention to one of ordinary skill in the art.

The liquid MDI adducts of the Markusch et al reference are described as being freeze stable. These liquid isocyanate compositions comprise (A) an allophanate-modified MDI having an NCO group content of 16 to 30%, (B) a low molecular weight branched aliphatic dihydroxyl compound and (C) an epoxide functional compound. The allophanate-modified MDI (A) is the reaction product of (1) diphenylmethane diisocyanate having an isomer distribution of 0 to 20% by weight of the 2,4'-isomer, 0 to 2% by weight of the 2,2'-isomer and the balance (i.e. 78 to 100% by weight) being the 4,4'-isomer, with (2) an aliphatic alcohol. See column 4, lines 3-10 and lines 22-28. These are further reacted with (B) a low MW branched aliphatic dihydroxy compound and (C) an epoxide. Thus, it is apparent that the Markusch et al reference is actually directed to prepolymers of allophanate-modified MDI. Products containing both allophanate groups and trimer groups are not disclosed by the Markusch et al reference.

By comparison, the present invention is specific to stable liquid, allophanate-modified, partially trimerized diphenylmethane diisocyanate, not to prepolymers of allophanate-modified MDI. The combination of the Markusch et al reference with the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370) does not result in presently claimed invention. Rather, this combination leads the skilled artisan to prepare prepolymers as in the Markusch et al reference, which contain an epoxide, with the isomer distribution therein, the trimer catalyst from the Scholl et al reference (U.S. 5,124,370), and the catalyst system of the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308). This is not Applicants' presently claimed invention.

Even if one assumes that the skilled artisan only relied on the Markusch et al reference for the MDI isomer distribution to form the allophanate-modified MDI therein, combining this isomer distribution with the catalyst system of the Slack et al references ('609 or '308) and/or that of the Scholl et al reference, does not result in the presently claimed invention. The isomer distribution required by the Markusch

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et al reference does not clearly correspond to that of the present claims. Thus, the products formed from this substitution would not necessarily be stable liquids as required by the present invention. It is therefore respectfully submitted that one of ordinary skill in the art has no insight into the presently claimed invention from this combination of references.


The isomer distribution of the Markusch et al reference is not as broad as that which is disclosed by some of the references discussed above. However, it does not provide one of ordinary skill in the art any insight into the isomer distribution required by the present invention. Rather, it only suggests a different range of isomers to "try". It is readily apparent that the Examiner is applying an "obvious to try" standard of patentability. This is not the proper standard of patentability under 35 U.S.C. § 103(a).

Applicants respectfully submit that the presently claimed invention is not fairly suggested to one of ordinary skill in the art from the combination of the Slack et al references (U.S. 5,955,609 or U.S. 6,127,308) and the Scholl et al reference (U.S. 5,124,370), and optionally, further in view of the Slack et al references (U.S. Patent 5,663,272, U.S. Patent 6,887,399 and U.S. Patent 6,991,746), the Rosthauser et al reference (U.S. Patent 5,783,652), and/or the Markusch et al reference (U.S. Patent 6,482,913). Only after reading the present application does the presently claimed invention become "obvious" to one of ordinary skill in the art. Such a perspective does not provide a proper basis for a rejection of the present claims under 35 U.S.C. 103(a).

Applicants therefore submit that each of these rejections are improper and request that these be withdrawn.

It is respectfully requested that the present application be reconsidered in view of the preceding amendments and remarks. The allowance of Claims 1-18 is respectfully requested.

Respectfully Submitted,

By:   
N. Denise Brown  
Agent for Applicant(s)  
Reg. No. 36,097

Bayer MaterialScience LLC  
100 Bayer Road  
Pittsburgh, PA 15205-9741  
(412) 777-3804  
FACSIMILE PHONE NUMBER  
(412) 777-3902

f:\shared\kp\ldb341.ame

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